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XII. *On the Fossil Remains of Turtles, discovered in the Chalk Formation of the South-east of England.* By GIDEON ALGERNON MANTELL, Esq., LL.D., F.R.S., F.L.S., F.G.S., &c.

Received May 11,—Read May 20, 1841.

ALTHOUGH no species of the order Testudinata now inhabits the British Isles, and the Turtles and Tortoises admitted into the fauna of Great Britain by modern naturalists are only individuals which have strayed or been drifted from other latitudes, the fossil remains of Chelonian Reptiles which occur in the strata of this country afford indisputable evidence, that in very remote periods, the seas, rivers, and lands of Europe, swarmed with marine, lacustrine, and terrestrial forms of this family.

It is well known that the earliest indications of the presence of reptiles on this planet, are the impressions of the feet of Turtles on the rocks of the new red sandstone formation. These foot-marks have been detected in Dumfriesshire, at Stourton quarry near Liverpool, and in various places in Germany, and are supposed to be referable to land and lacustrine species; but no decided remains of Turtles have been found in strata antecedent to the muschelkalk. At Luneville, in deposits of this epoch, bones and fragments of the carapace or dorsal shield of an extinct species have been observed.

In the oolite formation, the remains of Testudinata occur more abundantly. M. CUVIER has described two large extinct species of Emys, from the Jura limestone at Soleure, and bones of the same genus from Solenhofen. Traces of similar fossils exist in the Stonesfield slate, and in the Bath oolite.

The Purbeck limestone abounds in remains of these reptiles, and they also occur in considerable abundance in the other divisions of the Wealden. I have collected from the strata of Tilgate Forest, bones and portions of the carapace and plastron of several species, belonging to three subdivisions of the order, namely, Chelonia, Emys, and Trionyx*. These relics of the contemporaries of the colossal reptiles, which formed the subject of a memoir I had lately the honour to lay before the Royal Society, occur for the most part in a very mutilated state, the specimens consisting of rolled fragments of bones, particularly of the expanded ribs. There are, however, a few examples which illustrate the characters and relations of the originals. Some of the bones and plates from Tilgate Forest, were determined by M. CUVIER to belong to a remarkably flat Emys, identical with a species discovered by M. HUGER in the Jura limestone at Soleure†. Other examples, consisting of ribs with a smooth

* Wonders of Geology, vol. i. p. 384.

† Ossemens Fossiles, tom. v. p. 230.

surface, and of nearly equal width throughout, with pointed striated extremities, and bearing impressions of the horny integument or tortoise-shell—portions of a smooth osseous border—and sternal plates with radiated, dentated margins, appear to belong to marine Turtles or *Chelonia*, properly so called. Some specimens of this kind indicate a total length of thirty-four inches*.

But the most remarkable form of Testudinata discovered in the Wealden, is one allied to the predaceous freshwater Turtles, the *Trionyces*. It is well known that the existing animals of this division of the order have the extremities of the ribs free, and not articulated to an osseous border; and that there are intervals between their costal processes, even in the adult state. The external surface of their ribs is covered with pits or depressions for the attachment of the soft skin, the only integument with which the *Trionyces* are invested; and being destitute of scales, their bones exhibit no furrows, as in the other genera. But the ribs from Tilgate Forest, while they possess the shagreen surface of the recent *Trionyces*, bear the impress of a scaly covering; and instead of being nearly of an equal width throughout their entire length, as in the existing freshwater and marine Turtles, gradually enlarge towards the distal extremity, till the outer is nearly twice as wide as the inner termination; a character which obtains only in the ribs of land Tortoises†. The specimens in question present, therefore, an assemblage of osteological characters which are not found in any known recent species; and until the discovery of more considerable and connected portions of the skeleton, the affinities of the original to existing forms cannot be accurately determined.

In the chalk formation of England, the indications of Testudinata are very rare. My collection of cretaceous fossils, which consisted of upwards of ten thousand specimens from the South Downs, contained but one certain relic of this order of Reptiles; and I have reason to believe that other collectors have not been more fortunate. The Maestricht beds, however, which are referable to the chalk, have long been celebrated for the remains of Turtles; and the ludicrous mistake of FAUJAS St. FOND, who figured and described some bones and sternal plates of a Turtle from St. Peter's mountain, as the antlers of an Elk‡, led Baron CUVIER to institute a rigorous examination of the originals. The result of his inquiry was, that the fossils in question, from the quarries at Maestricht, belong to marine Turtles, differing from any of the known recent species§.

In the tertiary formations, the remains of Testudinata are common, and most of the extinct forms of *Chelonia* are found in these deposits. The *Trionyces*, the existing species of which are inhabitants of the Nile, Euphrates, and other rivers of warm climates, occur fossil in the strata of the Paris Basin, associated with skeletons of Palæotheria, &c.

The tertiary molasse of Switzerland also contains bones of the genera *Emys* and

* Fossils of Tilgate Forest, plates vi. vii.

† Geology of the South-East of England, p. 255.

‡ Hist. Nat. Mont. de St. Pierre, p. 103.

§ Oss. Foss., tom. v. plate xiv.

Trionyx. The remains of land Tortoises are found at Aix, and in the London clay of the Isle of Shepey.

Lastly, the deposits which have been formed during the modern epoch, contain the osseous relics of marine, lacustrine, and terrestrial Testudinata; as, for example, the calcareous strata beneath beds of lava in the Isle of France*; while in the accumulations of detritus which are still in progress, similar remains are being entombed, as in the modern conglomerates on the shores of the Bermudas, and of the Isle of Ascension, in which the bones and even eggs of Turtles are daily becoming imbedded and preserved†.

As, from the extreme rarity of Chelonian remains in the cretaceous deposits of Great Britain, any well-preserved relics of this kind possess considerable geological interest, I beg to lay before this learned Society a description, with figures, of a remarkable fossil Turtle from the chalk of Kent. I am indebted for this specimen to Mr. BENSTED of Maidstone, a gentleman whose zeal for the advancement of palæontology I have already had occasion gratefully to acknowledge. This fossil, which has been delineated of the size of nature by M. DINKEL, in the annexed drawings (Plate XI. and XII.), consists of the carapace or dorsal shell of a small Turtle, with some of the sternal plates, vertebræ, and one of the coracoid bones. It was obtained by Mr. BENSTED from a quarry of the lower chalk at Burham, which is situated at a short distance from the banks of the Medway, between Chatham and Maidstone. This locality had already obtained some celebrity from having furnished several good specimens of fossil fishes of the genus *Beryx*, of the same species with those discovered by me in the chalk near Lewes, in Sussex, and which have been figured by M. AGASSIZ‡. The mandibles of a *Chimera*, teeth of the shark family, remains of Crustacea, Ammonites, Nautili, Inocerami, and the usual shells of the lower chalk, with fuci (*Fucoides Targionii*) and fragments of wood, have also been collected in the same quarry. The only portion of a Chelonian reptile that had been obtained from the chalk-pit at Burham, before the discovery of the specimen which forms the subject of the present communication, was a fragment described by Professor OWEN in a paper lately read before the Geological Society of London. This fossil comprises four marginal plates of the carapace, and some small fragments of the ribs, of an individual not exceeding in size the present example. The marginal plates are united by the usual finely indented sutures, and each is impressed along the middle of its upper surface with a line corresponding to the margin of the horny plate by which it was originally defended. The external edge of each plate is slightly emarginated in the middle. "These plates," Mr. OWEN observes, "are narrower in proportion to their length than those of any of the existing marine Chelonia; and they deviate still more in the character of their internal articular margin, from the corresponding parts of terrestrial tortoises. But they sufficiently agree with the marginal plates of the

* Ossemens Fossiles, tom. v. p. 248.

† Wonders of Geology, p. 78.

‡ Recherches sur les Poissons Fossiles.

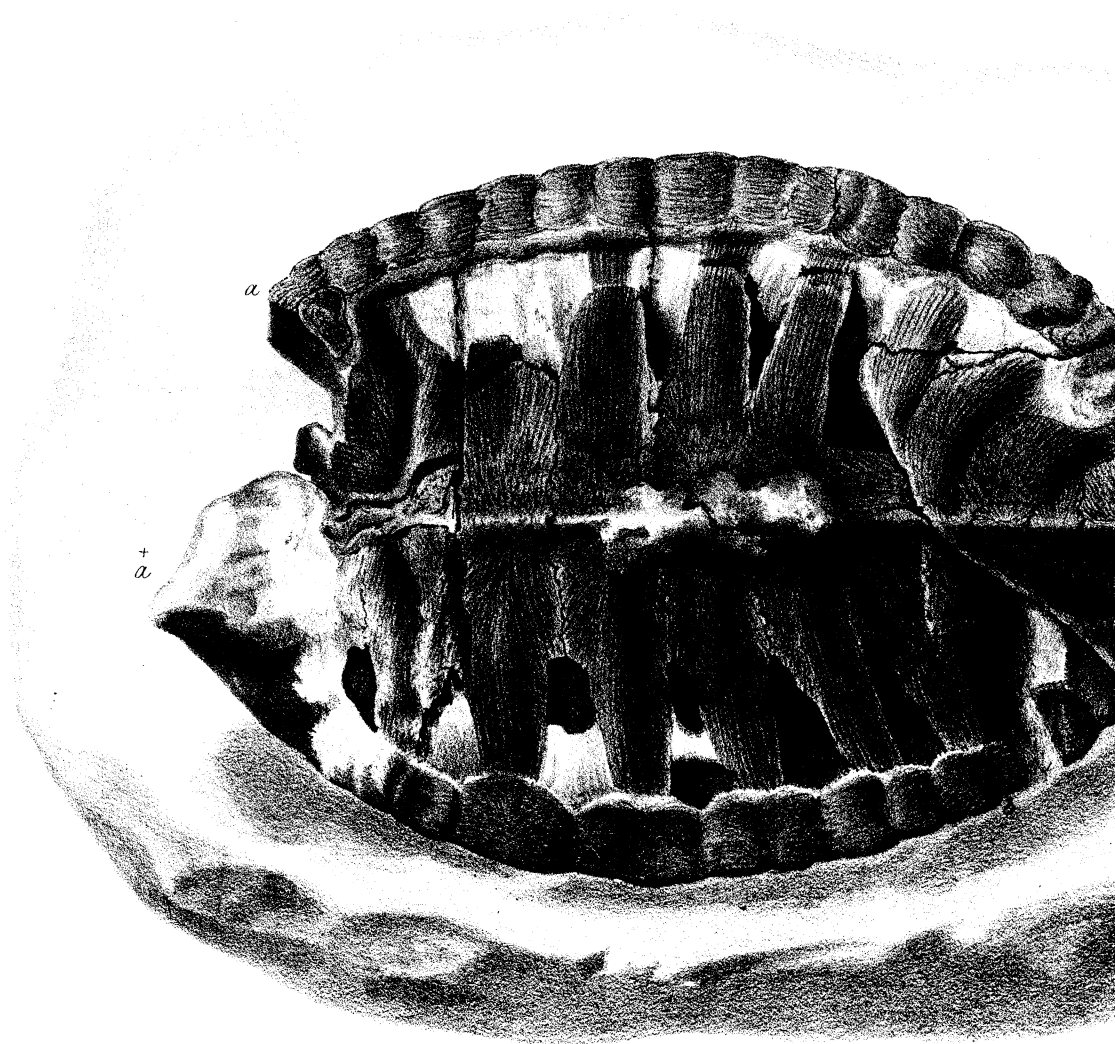
carapace of the Emydes, to render it probable that these remains are referable to that family of Chelonia which live in fresh water or estuaries*."

The specimen discovered by Mr. BENSTED, consists of the dorsal shell of a young Turtle, with a considerable portion of the plastron, and is adherent to a block of chalk by the external surface of the sternal plates. The carapace, which is almost complete, is of a depressed ovate form, and is six inches long, and $3\frac{3}{4}$ inches wide in the middle. It is composed of eight ribs on each side the dorsal ridge, and is surrounded by a border of marginal plates, which, with the exception of an interval of about two inches on the anterior and dextral aspect (*a a**, Plate XI.), is entire. These plates are joined to each other by finely indented sutures, and bear the impress of the horny scales, or tortoise-shell with which they were originally covered. The expanded ribs are united together throughout the proximal half of their length, and gradually taper to their marginal extremities, which are protected by the plates of the osseous border. Such are the characters presented by the specimen, as shown in Plate XI. But Mr. BENSTED has with great skill dissected away the chalk, so as to admit of the removal of a great portion of the dorsal shell (from *a** to *b*, Plate XI.), and thus some of the vertebræ, four plates of the plastron, and a coracoid bone, are brought to view, as seen in Plate XII. fig. 1. The inner surface of the carapace is also thus displayed (Plate XII. fig. 2.), together with the mode of union and growth of the costal processes, and the attachment of their distal extremities to the osseous border. The accuracy of the drawings renders any detailed description unnecessary.

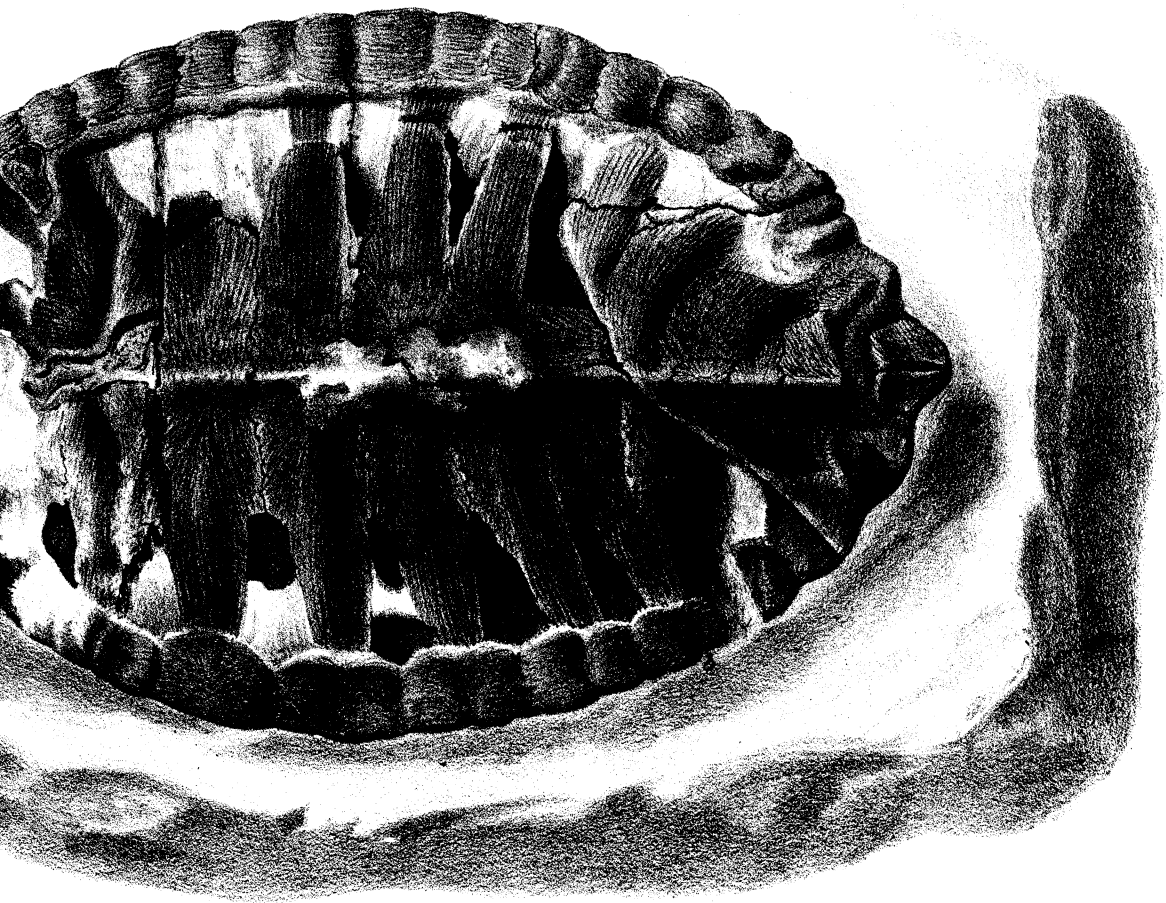
The number and variety of existing Testudinata are so great, that it is scarcely possible to determine, from the remains of the cuirass alone, whether a fossil Turtle belongs to an extinct species. It might seem easy to decide whether it were referable to the marine or lacustrine Chelonia, but even this question is not readily solved, when, as in the present instance, characters usually supposed to be distinctive of the subgenera, are found blended in the same individual. At first sight, the form of the dorsal shell, and the interspaces between the distal half of the ribs, might lead to the inference that it is the cuirass of a marine species; but my friend Mr. BELL, who has carefully examined the specimen, and compared it with the recent forms in the Hunterian Museum, and in his own matchless collection of Testudinata, refers it to the Emydidæ; an opinion in accordance with that entertained by Mr. OWEN of the remains above mentioned, as having also been procured from the chalk-pit at Burham.

Mr. BELL observes, that "the manner in which the ribs diminish in breadth towards the circumference of the carapace, indicates a gradual growth, and a tendency towards the complete filling up of the interspaces; very different from that observable in the marine Turtles, in which the broad portion terminates abruptly, and the narrow part is almost linear in its proportions." The annexed sketches will serve to exemplify these remarks. Fig. 1. represents the termination of the expanded part of the ribs in the marine Turtles; fig. 2. the corresponding processes in the fossil.

* Proceedings of the Geological Society.



Emys Benstedti,
from the Chalk of Kent.
in the collection of
Dr. Mantell.



Emys Benstedii,
from the Chalk of Kent.
in the collection of
Dr. Mantell.

J. Basire, Sculp.

Fig. 1.

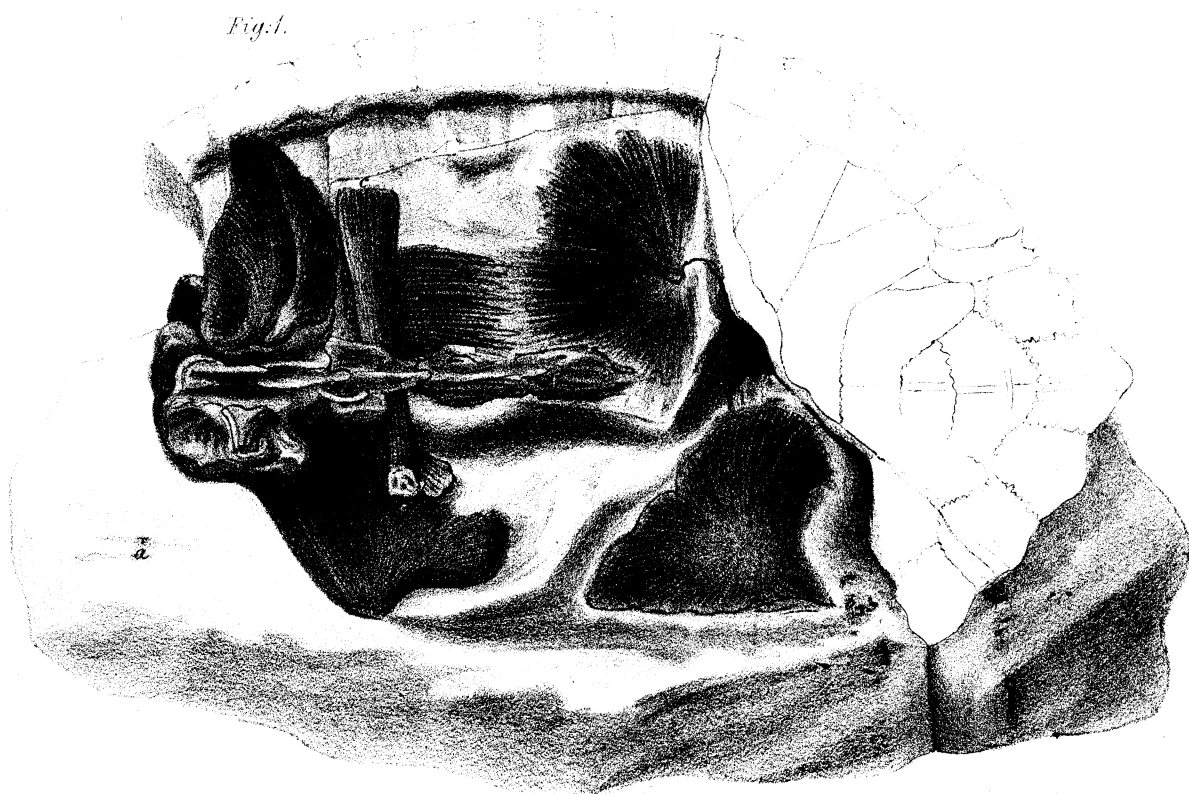
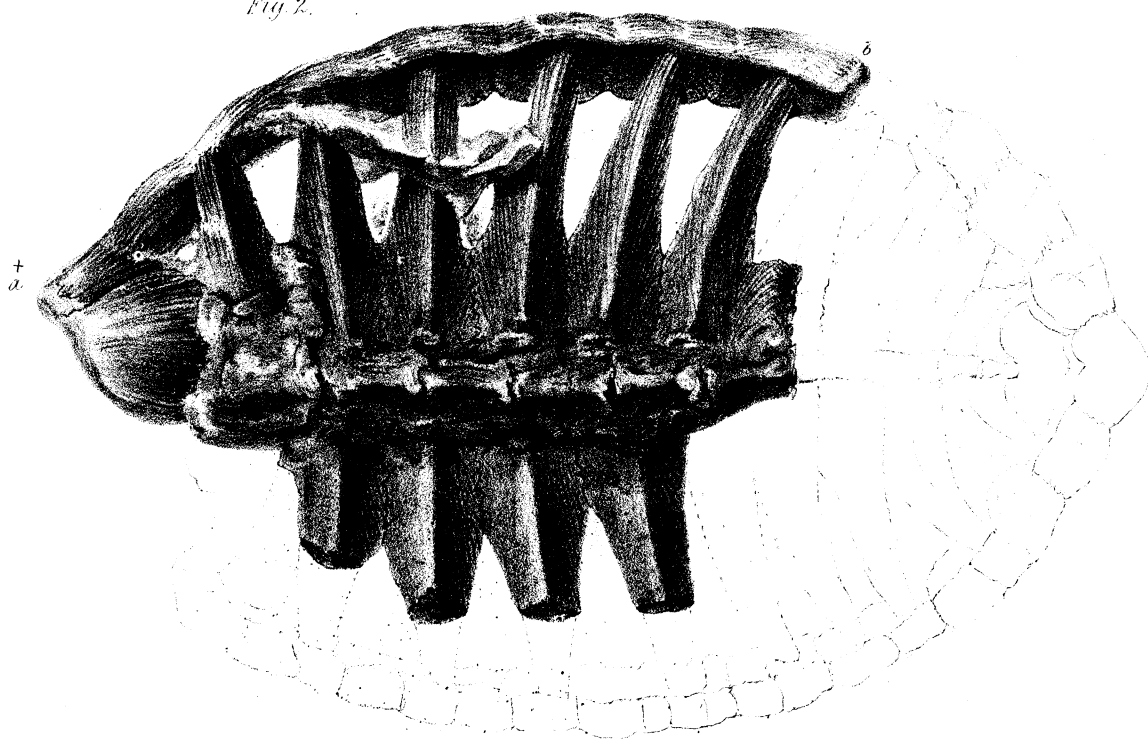


Fig. 2.



Emys Benstedii.

in the collection of Dr. Martelli.

Pl. 156.

Fig. 1. Chelonia.

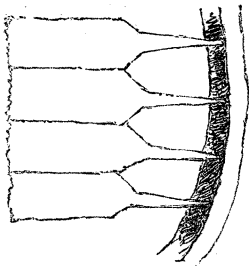
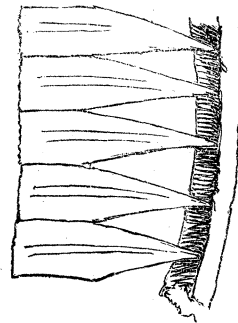


Fig. 2. Fossil Turtle.



Mr. BELL also states, that "The fossil is nearly allied in form to the common European *Emys* (*E. lutaria*): but the skeleton in the whole genus is so much alike, that it is impossible to determine to what species it is most closely related, especially in this young state. Of its true fluviatile or lacustrine character, however, there can be but little doubt." From such high authority I cannot presume to differ, and therefore propose the name of *Emys Benstedii* for this matchless specimen of Turtle from the British chalk. It is, however, to be remarked, that the plates of the plastron in this example, so far as their characters can be ascertained from the remains figured in Plate XII. fig. 1, approach those of the marine Turtles in their form and mode of union; and that the *coracoid* bone, which is seen displaced and lying in a transverse direction beneath the vertebral column (Plate XII. fig. 1. e), more closely resembles the corresponding bone of the marine, than it does that of the freshwater Turtles, as may be seen by the annexed figures. Fig. 3. Coracoid of the fossil; fig. 4. the corresponding bone of a marine Turtle; fig. 5. the coracoid of an *Emys**.

Fig. 3.



Fig. 5.



Fig. 4.



* "Dans les tortues de mer, l'os coracoidien est très long, et peu élargi à son extrémité sternale. Dans les tortues d'eau douce il est plus long que large."—Oss. Foss., tom. v. p. 211.

In the same quarry at Burham, Mr. BENSTED has discovered an abdominal plate of a small Turtle, and a femur which approximates to that of *Trionyx* (fig. 6.).

Fig. 6.

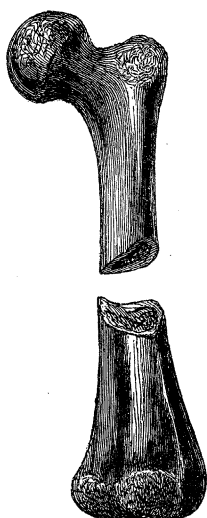
Femur of a *Trionyx*? from the Kentish chalk.

Fig. 7.



Mandible of a Turtle from Lewes.

The beak of the lower mandible of a Turtle from Lewes (fig. 7.), is the only other Chelonian remain from the chalk formation of England that has come under my observation.

The occurrence of these isolated examples of freshwater (?) Turtles, amidst the marine exuviae of the cretaceous epoch, must be referred to the same category as that of the *Iguanodon* in the Kentish rag of Maidstone. They afford evidence of the existence of currents that carried far out to sea the carcasses of some stray terrestrial and fluviatile reptiles, which at length became engulfed in the depths of the ocean with the remains of marine fishes and mollusca. In like manner in modern times, Turtles which are inhabitants of the Indian and Atlantic oceans, are occasionally drifted to the shores of the British Islands; and doubtless many are imbedded in the deposits which are in the progress of formation at the bottom of the European seas.

*Crescent Lodge, Clapham Common,
May, 1841.*